National Aeronautics and Space Administration

Office of Space Science

SPACE SCIENCE ADVISORY COMMITTEE

November 18-20, 1998
NASA Headquarters
Washington, DC

MEETING REPORT

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Executive Secretary

David C. Black
Acting Chair

SPACE SCIENCE ADVISORY COMMITTEE
NASA Headquarters
November 18-20, 1998

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Wednesday, November 18

Opening Remarks/Announcements

Dr. David Black, Acting Chair of the Space Science Advisory Committee (SScAC), called the meeting to order and welcomed members and attendees. He distributed a letter from Dr. Anneila Sargent, previous Chair of SScAC, thanking the Committee for their support during her tenure as Chair. Issues on the agenda included the implementation plan for the Astrobiology Institute, the strategic planning process, Mars architecture, proposals for two new Task Forces (Planetary Protection and Technology), and the Space Operations Management Office (SOMO).

OSS Program and Budget Status

Dr. Edward Weiler, recently appointed Associate Administrator for the Office of Space Science (OSS), discussed the current OSS organization, recent space science highlights, the status of current missions, Announcement of Opportunity (AO) schedules, the status of the Technology Program, the OSS budget, responses to SScAC recommendations from the last meeting, and the upcoming National Academy of Sciences (NAS) Decennial Survey. The new Director of the Research Program Management (RPM) Division has been selected, but has not yet been finalized. One of the long-term goals of the Hubble Space Telescope (HST) program has been accomplished—an image of the faintest and farthest objects in the universe (30^{th} magnitude) was detected by the Near Infrared Camera and Multi-Object Spectrometer (NICMOS). Images from the Hubble Deep Field (South) will be released next week. Galileo continues on its extended mission to observe Europa and has provided images of Jovian lightning and daytime storms. The Transition Region and Coronal Explorer (TRACE) observed a magnetic energy burst (magnetic reconnection) on the Sun on May 8. All of these events have excited the public and received good coverage in the press.

There will be a total of 8 space science launches in the next 12 months. Upcoming launches include: Mars Orbiter in December 1998, and the Advanced X-ray Astrophysics Facility (AXAF), the Wide Field Infrared Explorer (WIRE), University Explorer (UNEX)-1, the Far Ultraviolet Spectroscopic Explorer (FUSE), Stardust, Mars Surveyor Lander, and Deep Space (DS)-2 in CY 1999. The Hubble flight computer (HOST) test, the NICMOS cryo-cooler, and solar Spartan 201 flew successfully on STS-95. The Solar and Heliospheric Observatory (SOHO) has had a remarkable recovery. Control of the SOHO spacecraft was lost in June. All twelve SOHO instruments are now working—some of them even better than before. Dr. Weiler discussed the major causes of the AXAF launch delay, which included problems in flight software testing, and the availability of the Air Force shipping container. The readiness ship date is now January 8 leading to a projected launch in late April/early May. The budget impact of $39 million resulting from the delay must be accommodated in the FY 1999 operating plan. Most of the funds will come from uncosted carryover with the balance of the funds to come from the AXAF Mission Operations and Data Analysis (MO&DA) budget. Unfortunately, the AXAF

launch slip and the planned refurbishing of Columbia (which cannot be delayed any further) will lead to a7 - 8 month delay in the next HST servicing mission. That delay will require $20-$40 million in extra funds in the out-years. Currently, there are only four gyros functioning on HST, and three are needed for science operations. HST will be safe regardless of future gyro failures, but the failure of two additional gyros would result in a complete loss of science operations until the servicing mission.

Most of the missions in development are doing well. Mars Global Surveyor (MGS) will enter its final mapping orbit in February. Two UNEX's were selected this year—CHIPS and IMEX. However, there are now serious questions concerning the availability of the launch vehicles (a Proton IV and a piggyback ride on a Titan 4) proposed for both missions. The proposals submitted in response to the last Mid-class Explorer (MIDEX) AO are now being peer reviewed, and selection is planned for early January. In the Discovery Program, five proposals were selected for feasibility studies, with downselect next June.

The FY 1999 budget is fully consistent with the Strategic Plan. However, there were a number of earmarks placed by Congress into that budget which, collectively, will have the net effect of a $21.2 general reduction. Some of these earmarks and add ons will solve known problems. Others add program content but without the funding required to full support that content. Earmarks and add ons include: Mars 2001 (an additional $20 million), Space Solar Power, Near-Earth Object Tracking, a NASA Science Center at Glendale Community College, $ 7 million for Next Generation Space Telescope (NGST) Advanced Technology Development (ATD), full funding for Solar-B, cross-cutting advanced technology development, and funding for various projects and programs around the country that are of interest to Congress. This was the largest number of earmarks OSS has ever seen in its budget.

At its last meeting, SScAC was concerned about the SOMO, organizational aspects of the Astrobiology Institute, the technology planning process, and implementation of the recommendations from the Task Force on R&A and MO&DA. These topics will be addressed in presentations later in the meeting. The NAS Decennial Survey will be starting within the next month. A policy guideline letter has been issued clarifying how formal advice on new missions is to be provided to OSS, NASA, and external review groups, such as the NAS Astronomy and Astrophysics Survey Committee. SScAC is the sole formal advisory committee for the OSS. It is supported by four Subcommittees. SScAC or the Subcommittees may form Task Groups to carry out special studies. Such groups will, however, provide input and report only through the OSS formal advisory structure, not directly to the NAS. Direct interactions with the Astronomy Survey Committee will be through the Associate Administrator and SScAC.

In response to a question, Dr. Weiler discussed the Wide Field Planetary Camera (WFPC)-3 situation. The final HST servicing mission was to be in 2002 (now 2003). HST has been approved as an extended mission to 2010, and this would mean that the Advanced Camera now under development would have to last nearly ten years, which is unlikely. In order to avoid the possibility of HST having no imaging capability for an extended period, there is a proposal to use reserves to build a simple duplicate of the WFPC-2. This proposal has been peer reviewed and endorsed, and planning has proceeded on the basis of building a simple clone. Subsequently, science groups pressed for the addition of an infrared capability, an addition that

has significant cost and technical ramifications, and no funds are available for this augmentation. Any funds for this purpose would have to come from the Guest Observer program (10-20% reduction), and the community would have to accept this reduction as a sensible and desirable scientific trade-off. In addition, GSFC would have to conduct an in-depth engineering review to establish the technical feasibility of adding an infrared capability.

With respect to the Decennial Survey, Dr. Riegler noted that the National Research Council (NRC) will not accept dual membership on a NASA advisory committee (or subcommittee) and on the Survey Committee itself. The Chairs of Survey Committee Panels also may not be members of a NASA Committee. Panel members, however, may serve on NASA committees. SScAC discussed the policy letter from Dr. Weiler described earlier. Dr. Riegler noted that several Management Operations Working Groups (MOWG's) are continuing and were approved by SScAC about a year ago. Whenever ad hoc working groups are created, they must be chartered by SScAC or a Subcommittee and must have a "sunset" date. Groups and individuals may speak directly to the NAS, as long as they make it clear that they speak for themselves, not on behalf of NASA or the formal advisory structure.

Astrobiology

Dr. Michael Meyer provided an overview of the Astrobiology program. Exobiology is an element of the Research Opportunities in Space Science (ROSS) NASA Research Announcement (NRA). An evolutionary biology program will be started this year in OSS. There are also key linkages with elements of the Earth Science and Life and Microgravity Science programs. The NASA Astrobiology Institute (NAI) is an experiment to explore a new way to organize and carry out research. The implementation plan for the NAI has been written and is in review, and a Director will be selected soon. The total budget for FY 1999 is $23.6 million.

Dr. Scott Hubbard, the interim manager of the NAI, discussed the implementation plan. A need was identified early in the process for a plan to document the roles, responsibilities, relationships and required resources for the Institute. An interim management organization was established in July 1998, with a charge to negotiate/fund/track the cooperative agreements with selected investigators, prepare a NAI implementation plan, host the first general meeting of selected Institute participants, initiate applications of information technology for the virtual Institute, and establish the Institute's education and outreach program. Also of high priority was recruiting the permanent Director and getting staff on board. The recruitment of a permanent Director is nearing completion, and "short list" interviews are underway. Dr. Weiler added that after a selection is made, the plan is to go to Mr. Goldin for his support and help in bringing the candidate on board. Dr. Hubbard described the NAI organization. The administrative reporting is from the Director, through the Director of Ames, to OSS. The budget, policy, and science direction, however, is the responsibility of OSS. There will be an independent science oversight committee, chartered by OSS, to evaluate the quality of work of the NAI. The chair will be selected with the concurrence of the Ames Research Center (ARC) Director. Members of the committee will be selected to cover all of the relevant scientific disciplines. In response to questions about authority and reporting, Dr. Weiler emphasized that the NAI is a NASA Institute; and when it comes to budget and policy, the NAI works for NASA Headquarters. Dr.

Hubbard described the management responsibilities of the NAI Director's Office, as well as the management responsibilities of the NASA Headquarters Offices. The Director should be able to carry on research (funds have been allocated for this purpose) after the NAI is up and running. ARC has assigned a Public Affairs Officer to work the media interface with Headquarters and the NAI member organizations to provide visibility to NAI activities. The virtual collaboration and networking which is at the heart of the NAI concept will start by using proven collaborative tools and processes. Two startup goals are to establish the routine use of group videoconferencing and science desktop collaborations. The Fellows program will be implemented in direct analogy to the Hubble Fellows Program. Some of the SScAC members felt that the Fellows program should not be restricted to Fellows resident at the member institutions, as indicated by Dr. Hubbard. Planning for the next Cooperative Agreement Notice (CAN) has already begun with a probable release date in spring 1999. Dr. Meyer noted that there are disciplines/science areas that need to be addressed that were not included in the first selection; therefore, this CAN will be more focused and will target certain areas. Dr. Black noted that SScAC and the Origins Subcommittee (OS) have already been concerned about the absence of participation of a permanent Director in the current selections. The next selection should not be made in the absence of a Director who should also play a major role in preparing the new Announcement. The real test of the success of the Institute is whether it will be seen as a value-added resource by the science community. In response to a question on funding allocation, Dr. Hubbard indicated that the intent is to keep the administrative cost in the 5% or less range. Most of the funding has been put into Principal Investigator (PI) cooperative agreements. Education and public outreach funding is around 5% of the total.

Astrobiology Roadmap

Dr. David Morrison discussed the background and status of the work on developing an Astrobiology Roadmap. The roadmapping process has had about two years of preliminary work, addressing the question of "what is astrobiology." In July of this year, a roadmapping workshop was held to define questions, goals, and objectives and to identify technology and mission opportunities. In order to be successful, the roadmap needs to impact OSS missions. The Astrobiology Roadmap will start with three basic thematic questions: Where did we come from? Are we alone in the universe? What is our future on Earth and in space? From the three basic questions, ten goals form the heart of the roadmap, which are: understand how life arose on the Earth; determine the general principles governing the organization of matter into living systems; explore how life evolves on the molecular, organism, and ecosystem levels; determine how our planet's biosphere has co-evolved with the Earth; establish limits for life in environments that provide analogues for conditions on other worlds; determine what makes a planet habitable and how common these worlds are in the universe; determine how to recognize the signature of life on other worlds; determine whether there is (or once was) life elsewhere in our solar system, particularly on Mars and Europa; determine how ecosystems respond to environmental change on time-scales relevant to human life on Earth; and understand the response of terrestrial life to conditions in space or on other planets. Dr. Morrison showed the linkages among these goals. The plan over the next 6 months is to work with the other Enterprises, to address budgetary and programmatic issues, and look at the near-term opportunities. The complete roadmap can be found on the Astrobiology Web site. Dr. Black added that it is important that the Astrobiology

Roadmap be well-integrated with the strategic planning structure. Close communication between the astrobiology activity and the four themes is essential.

Ethics Briefing

Mr. Andrew Falcon, Senior Ethics Attorney in the Office of General Counsel and lead attorney for Federal Advisory Committee Act (FACA) issues, gave the Subcommittee its required annual ethics briefing for Special Government Employees (SGE's) serving on NASA advisory committees. He discussed the FACA requirements, service on NASA advisory committees as SGE's, and ethics rules for SGE's (financial conflicts and post-employment restrictions). Mr. Falcon noted that as long as the activities of the advisory committees stay on a programmatic level and avoid contract-level discussions, the restrictive statutes should not be triggered. It is important to recognize potential conflicts before the fact, when the issue can be resolved in advance. He emphasized notification to the Executive Secretary or the Office of General Counsel if there are any questions regarding an area of discussion that the Committee is pursuing. Executive Secretaries have a responsibility to stay aware of issues and agenda topics that could present problems. Mr. Falcon provided the Committee with the contacts in the Office of General Counsel at NASA for questions or issues regarding ethics. Dr. Black raised the issue of Committee deliberations and JPL which Mr. Falcon indicated is often an issue. He advised contacting the General Counsel at Headquarters or at JPL if there are questions about whether the deliberations affect the JPL contract.

Preparing for the 2000 Strategic Plan

Dr. Marc Allen discussed the planning for the update to the Space Science Enterprise Strategic Plan and identified issues that should be considered in the process. He reviewed the structure of the 1997 Strategic Plan, which was roughly hierarchical in construction, with fundamental questions, science goals, and science objectives. It was a very good expression of consensus as well as an excellent advocacy resource. However, he felt that there were a few weaknesses that should be taken into consideration in preparation of the next version. There was a lack of alignment between the Space Science Enterprise broad mission statement (contained on the front inside cover) and the OSS thematic organization. Some of the relationships were unclear, e.g., between themes and "fundamental questions," themes and "science goals," and science goals and science objectives. Also, there was inadequate coupling between the technology section and the planned program. Dr. Steven Squyres suggested that SScAC agree early on the general structure of the OSS Strategic Plan so that the Subcommittees' work would be consistent with that structure. Dr. Allen indicated that the general approach would be to build on the 1997 product, update it, and substantially strengthen it in a few critical places. The challenges for the preparation of the 2000 Plan are to improve its usefulness for NASA strategic management, as well as the Government Performance and Results Act (GPRA) and other performance assessments.

Dr. Allen presented a strawman outline for the 2000 Plan for discussion and reviewed the major tasks that need to be accomplished over the next year. An Executive Summary (or brochure) is needed. He suggested that fundamental questions rather than broad mission statements be used for the frontispiece. Part I—Our Goals—should focus on the scientific drivers and intellectual

structure. The program itself should be described in Part II. He suggested adding a category for the Mid-Term Program (2008-2013), along with a more detailed discussion of the technology capability required to implement that Mid-Term program, and the introduction of a new category that addresses the long-term future (up to 50 years from now). Dr. Allen will prepare a plan for the development of the Strategic Plan. The update of the theme roadmaps for science and technology is the responsibility of SScAC, the Subcommittees, and the ad hoc working groups. OSS will assemble the strawman integrated program using community input from the roadmapping process. The essentials of the Plan will be validated at a consensus meeting (similar to Breckenridge) to be held in November 1999. The main task for the theme working groups/roadmapping teams is to revisit the existing roadmaps in order to: validate the existing content in terms of current knowledge; revisit and validate or modify the goals and objectives as needed; identify the goals and objectives for each theme; factor in technology requirements and identify supporting research needs; and conceive a long-term "vision" for missions and technology through 2050. The Subcommittees and SScAC itself will then turn the roadmaps into the strategic plan, with a consistent flowdown from the NASA Strategic Plan through the specific missions. To support the overall schedule (which is driven by the need to support the development of the FY 2002 budget), the roadmap review must be completed by fall 1999 with the subsequent "convergence" retreat now scheduled for November 8-12, 1999. The draft Strategic Plan will be completed and distributed for comment by mid-January 2000. To impact the FY 2002 budget, the OSS must have the Strategic Plan released by late summer 2000. Because of the apparent mismatch in schedules between the strategic plan development and the NRC Decennial Survey, there have been some preliminary discussions with the Survey Committee on this issue. OSS plans to delay final approval and release of the Strategic Plan until after formal input from the NRC Decennial Survey has been received and factored into the development of the Strategic Plan. The plan is to have input from the Survey Committee in April/May 2000, with the SScAC meeting to review the final Plan in June/July 2000. This schedule will permit a final Strategic Plan to go to the OMB with the submission of the FY 2002 budget.

Technology Program Highlights/Issues

Dr. Peter Ulrich discussed a proposal for formation of a Technology Task Force to focus on the integration of technology planning with the development of the next OSS Strategic Plan. The space science program of the future depends on revolutionary advanced technologies, and it is extremely important that Advanced Technology Development (ATD) plans are reviewed, updated, and assessed for readiness. Technology development planning must be an integral element in the strategic planning process. The proposed Task Force on Technology Readiness would review the current ATD planning, seek out pertinent information on ATD opportunities from a broad cross section of technology providers, examine the pros and cons of alternative ATD strategies, and develop a set of possible approaches to support the science strategy. The group would be an independent fact finding team that would report to SScAC. The Task Force activities would be carefully coordinated and integrated with the strategic planning activities of the SScAC Subcommittees. Findings would be reported on a regular basis to SScAC and the Associate Administrator for Space Science. The proposed membership is the two technologists on SScAC, the four technologists from the Subcommittees, and six to eight additional spacecraft system technologists. The Task Force would tap the resources of the Advanced Technology and

Mission Studies (AT&MS) Division to accomplish its work. Dr. Ulrich requested concurrence from SScAC on the terms of reference and membership. He indicated that he would like to have the first meeting in January. Other meetings would be coordinated with the Subcommittee strategic planning activities.

SScAC was particularly concerned with how the Task Force work would be coupled into the other strategic planning activities. In response to a question, Dr. Ulrich indicated that the existence of the Task Force will not replace the need for work on technology elements in the individual theme roadmaps. Rather, it will provide an integrating mechanism. Dr. Ulrich will supply the Task Force with AT&MS and Center staff to collect data and help them accomplish their charter. These people would attend the roadmapping meetings and participate in their activities. Dr. Squyres observed that this approach places a burden on the members of the proposed Task Force to have a deep and thorough understanding of everything going on within their theme's strategic plan. If there is an independent technology Task Force, there need to be open and thorough channels of communication between the Task Force and the Subcommittees' roadmapping working groups. Dr. Squyres suggested having status reports from the Task Force at future Subcommittee meetings as well as at SScAC. Dr. Allen observed that an important function of the Task Force would be to help ensure that the integrated technology plan really supports the Strategic Plan. This subject should be addressed in a separate section of the Strategic Plan. There was a general consensus that the Task Force activity is important and should go forward. Dr. Christine Anderson offered to work with Dr. Ulrich to further refine the approach and to revise the terms of reference to focus on the coupling between technology and strategic planning.

Dr. Ulrich noted that a Technology Showcase is on exhibit in the lobby of NASA Headquarters and invited the SScAC members to visit this exhibit. Two technology NRA's are in process: Explorer/Stratospheric Observatory for Infrared Astronomy (SOFIA) and a Broad Cross-Enterprise NRA. A Space Technology Management Operations Working Group (MOWG) was approved by the Associate Administrator in September and held its first meeting in October. It will deal with the cross-Enterprise technology program and will focus on assessments and critiques of management processes. The Space Studies Board (SSB) report on the Assessment of Technology Development in NASA's Office of Space Science has been released. The AT&MS Division concurs with the recommendations and plans to respond to them.

Committee Discussion/Review of Key Issues

SScAC discussed guidance to the Subcommittees on structure of the Strategic Plan. The Committee also discussed the timing of the NAS Decennial Survey and the Strategic Plan, the possibility of divergent input, and how such a situation might conceivably be handled.

A strawman outline, drafted by Dr. Allen, was reviewed and discussed and revised subsequent to the meeting for use by the Subcommittees in their roadmapping activities. The revised outline is contained in Appendix F.

As noted earlier, the Committee felt that an Integrated Technology Section needed to be added to Part II describing the program. SScAC also felt that the Part I Introduction should include science, technology, and education accomplishments. It is important to highlight areas where there has been significant progress since a demonstration of significant accomplishments is, in the final analysis, the ultimate justification for the program.

With respect to the Astrobiology Institute, SScAC got a better understanding of the role and relationship of the Director of the NAI with ARC. SScAC was pleased to hear that the science planning, policy, and the budget of the Institute are independent from ARC and come from NASA Headquarters. The oversight committee is a positive step and is an important element for ensuring appropriate "checks and balances." As previously noted, SScAC also felt that the fellowships should be more broadly distributed.

Thursday, November 19

Mars Program Architecture

Dr. Charles Elachi discussed the architecture for the Mars Exploration Program which has been presented to the Administrator and which is now serving as the basis for OSS planning. The Architecture Team was charged with developing an architecture for the next decade that would achieve significant advances toward understanding the biological history of Mars and search for evidence of past or present life and would prepare the technological and scientific groundwork for Mars exploration in the following decade. The Team was also asked to identify scientific investigations that would be enabled or significantly enhanced by human presence but did not have time to spend much time on this issue. Key assumptions underlying the study included: approval of the existing program through the 2001 Mars Missions, the budget profile as previously defined by OSS for the Mars Program, partnership with CNES (which is a critical element of the approach which has been proposed), and that the ESA/ASI Mars Express mission would take place. Key features of the desired architecture are: continuous flow of information and discovery, timely incorporation of new technology, sample return to Earth, and a long-term system view to exploration rather than a mission-by-mission approach. A key feature of the proposed architecture is the orbital storage of samples to be returned to the Earth. The basic mission scenarios is as follows. In 2003, a lander (with rover) will launch on a Delta III and will collect samples. The samples will be put into a Mini-Mars Ascent Vehicle (MAV) which will be put in orbit around Mars. In 2005, using the Ariane 5, an identical lander/rover and Mini-MAV will be launched and will retrieve a second sample and place it into orbit. That mission will also include an orbiter to collect the samples from 2003 and 2005 and put them into a return vehicle to Earth. The French will be providing the Orbiter; the US will be providing the sample collection and return device. This architecture will provide two sets of samples by 2008 rather than one, providing resiliency in the program and the confidence of obtaining at least one cache of samples. This approach could be repeated in 2007 and 2009, but two US launch vehicles would be used instead of Ariane 5. Micromissions could also be accommodated in 2005 and 2007. Dr. Elachi discussed the preliminary cost estimates. The budget for the proposed architecture appears to fit within the assumed funding envelope. By February, there should be a

detailed implementation plan that will assure that the architecture does fit within the budget profile. Landers are being designed so that 100 kg of science payload will be available. Micromissions provide a low-cost capability for delivering small payloads. They can be used as "advance scouts" for sample return sites or can be used for new scientific investigations (via penetrators, aerial platforms, or small landers). They present another research opportunity to the science community particularly for university-based research groups. The NAS review was very enthusiastic about the potential for new opportunities presented by the micromissions.

This new architecture is made possible by use of the Mini-MAV and orbital caching, international collaboration, and an integrated system approach. Beyond the baseline program, with a modest new initiative—a Mars Aerostationary Relay Satellite (MARSAT)—high data rate communication with Mars would be possible allowing the establishment of a long-term capacity for continuous communication with the surface. The SOMO has approved a Phase A study on this infrastructure which will be done this year. The cost estimate for this infrastructure is about $300 million. The Team discussed a long-term strategy for integrated robotic-human Mars exploration but did not make any recommendations regarding implementation. Another group should look at this more seriously. The NAS Committee on Planetary Exploration (COMPLEX) provided an assessment of the Architecture Team Report and concluded that the architecture is a well-thought out approach that will meet the program objectives. Planetary protection issues must be carefully addressed, and workshops on this subject will be planned. Sample handling will be a complex issue. The Team felt that development of a sample handling capability will require significant funding. Dr. Pilcher noted that the R&A program will require augmentation to build up a laboratory analytical capability as well as funds for sample handling and data analysis.

Planetary Protection Task Force

Dr. John Rummel discussed a proposal for a Planetary Protection Task Force (PPTF). NASA has a planetary protection policy to ensure preservation of biological and organic conditions on solar system bodies for future exploration, as well as to ensure protection of the Earth from potential extraterrestrial contamination. The Associate Administrator for OSS has been designated as the individual responsible for NASA's policy, but management of the policy is delegated to the Planetary Protection Officer. Mission requirements for planetary protection depend on the nature of the mission and on the nature of the target body. Missions/target bodies are divided into five categories: (1) not of direct biological interest, (2) remote chance of contamination, (3) significant chance of contamination by orbiters, (4) significant chance of contamination by probes, and (5) any Earth return. The SSB provides the principal advice external to NASA, and several reports have been issued regarding contamination and the biological potential of returned samples. The SSB recommended that a panel of experts should be established as soon as serious planning for a Mars sample return mission has begun to coordinate regulatory responsibilities and to advise NASA on the implementation of planetary protection measures. The proposed Planetary Protection Task Force (under SScAC) would respond to the SSB recommendation. The Task Force would provide advice on the programs, policies, and plans for planetary protection. Key issues to be addressed by the Task Force include a review of NASA's current policy, recommendation of an appropriate advisory structure for dealing with long-term planetary protection issues, interagency coordination, and appropriate

assignment/categorization for near-term missions going to small bodies in the solar system. Many different disciplines are required to deal with the issues, and the membership should reflect this diversity (12 to 15 members). It should have representatives from all concerned agencies. The PPTF would meet approximately twice a year, with a first meeting in February/March 1999 and a second meeting in August/September 1999. A report on the recommended advisory structure for planetary protection would be made by September 2000. Dr. Rummel requested the SScAC's endorsement of this proposal. The PPTF is intended to be an interim solution to deal with immediate needs and try to determine what should be done in the future. Findings of the Task Force would come forward to SScAC, which would provide advice to OSS and carry recommendations forward to the NAC. SScAC endorsed the proposal, but suggested that the group should attempt to complete its activities within a year of the start of its work.

Theme Status Reports/Reports from Subcommittees
Sun Earth Connection

Dr. Andrew Christensen reported on the Sun Earth Connection Advisory Subcommittee (SECAS) meeting, which was held September 21-23, 1998. There were several findings and recommendations:

- "Faster, Better, Cheaper" and Mitigation of Risk. There needs to be up front investment in both instrument and space systems technology. The continuity of development/testing/ operations teams is important. There should be clear policies regarding acceptable risk. The PI should be given clear responsibility for both the technical and financial success of the project.
- Outer Planets/Solar Probe. SECAS was pleased with the progress in the OP/SP program technical definition and Announcement of Opportunity (AO) plans and endorsed the mission plan with two near-Sun passes.
- Solar Terrestrial Probes. SECAS was generally pleased with the progress, including plans to support technology development for multiple spacecraft missions; however, funding levels are insufficient to meet the 18-month launch schedule called for in the roadmap.
- SOMO. SOMO tasking and budget liens look like they will further erode already tight Data Analysis and project budgets with a net decrease in support services.
- SOHO. SECAS was delighted with the recovery, but emphasized that the operating budget needs to be fully restored.
- Workload issues. SECAS was concerned about the workload on the OSS discipline scientists and saw the growth in new proposal opportunities and accompanying review process to be major factors in defining that workload. It recommended involvement of the scientific community in working with NASA to identify acceptable tradeoffs which would preserve the integrity of the review process while keeping the workload tractable.

Dr. Withbroe noted that the SEC theme is developing a set of "grand challenges." He showed some examples of images from TRACE, a SMEX mission which graphically illustrated how important science can come from a low-cost mission.

Astronomical Search for Origins (ASO)

Dr. Harley Thronson highlighted major activities in the ASO theme. The images from the Hubble Deep Field (South) will be released on November 23. The tests of HOST and the NICMOS cryocooler on STS-95 were successful. WIRE is on schedule for a late February 1999 launch. The spacecraft ring laser gyros on FUSE are having problems. The Space Infrared Telescope Facility (SIRTF) had a successful Critical Design Review (CDR) in September. SOFIA had a successful completion of high- and low-speed wind tunnel tests, and a successful aircraft Preliminary Design Review (PDR). Lockheed Martin and TRW were selected as industry partners on the Space Interferometry Mission (SIM); the Science Team AO will be released early next year. Architecture studies on NGST have been completed, and OSS is working on a draft plan for Science/Instrument team selection in late 2000 or early 2001. Three industrial studies on the Terrestrial Planet Finder (TPF) have been initiated. An outrigger contractor for the Keck Interferometer has been selected, and the CDR on the outrigger has been completed. The solicitations for the IR/Submillimeter/Radio and the UV/Visible/Gravity R&A programs will be merged with a single NRA to be released in FY 1999. The ASO theme is in the process of chartering task groups to work on concepts for new missions for the ASO strategic planning activity. These task groups will also be providing information to the NAS Decennial Survey panels but will do this only through the formal advisory structure, i.e., the Origins Subcommittee (OS), as detailed in the OSS policy guidance on advisory committee and ad hoc task groups. Dr. Thronson discussed a possible near-IR channel on WFPC-3. Cost is around $20-$30 million.

Dr. Black discussed the findings and recommendations from the OS meeting on November 9-10. Major agenda items were astrobiology, the NGST Science Operations Center (SOC), and the OSS Strategic Plan/NAS Decennial Study. The Astrobiology Institute implementation plan, especially provisions for external oversight and a clearly defined strong role for NASA Headquarters, was well received. However, the OS felt that the second round of selections should await appointment of the Institute Director. In addition, the OS was concerned about selection of too many teams at the next round, before the NAI is well grounded and successfully underway. The OS was encouraged by the strong interest and involvement of the new HST Institute Director in planning for the NGST SOC but was concerned about the need for carefully defining the scale of the operations and the skill mix at the Space Telescope Science Institute required for successfully implementing the NGST SOC.

Structure and Evolution of the Universe (SEU)

Dr. Alan Bunner provided an update on the SEU theme. AXAF is looking very good. The external review committee has completed its review, all of the flight software and other spacecraft problems have been resolved, and the project is working on getting the shipping container. The renaming of the AXAF should be announced around the first week of December. Gravity Probe (GP)-B has a schedule/financial problem and a re-examination of the GP-B schedule and budget is now underway. Dr. Bunner discussed the proposed plan for the Space Test of the Equivalence Principle (STEP). The Administrator feels that this project belongs in OSS, and the STEP team will be informed of the opportunity to propose STEP as an Explorer mission. The Office of Life and Microgravity Sciences and Applications (OLMSA) will continue to provide limited technology “bridge” funding in order to permit the Team to prepare

flight mission proposal to the Explorer program. OSS will be the "home" for fundamental physics experiments in space, e.g., tests of general relativity, equivalence principle, etc. (but not applications). With the DOE, SEU is co-sponsoring a symposium on Inner Space/Outer Space at the Fermi National Accelerator Laboratory in May 1999. DOE has agreed to be a co-sponsor for the Gamma ray Large Area Space Telescope (GLAST). Constellation X has received community support, and there has been a science working team meeting at GSFC. The establishment of Ad Hoc Working Groups to carry out the roadmapping activities has been approved by the Structure and Evolution of the Universe Subcommittee (SEUS).

Dr. Roger Blandford discussed the Laser Interferometer Space Antenna (LISA) project, which will measure low frequency gravitational radiation using a Michelson interferometer in space. This project will be the culmination of the "Voyage to a Black Hole" program. The project will have to deal with a number of severe technological challenges including the measurement of 20 pm displacements over 5 x 10^6 km baseline.

Solar System Exploration (SSE)

Dr. Pilcher discussed recent results from Mars Global Surveyor (MGS). Temperature profiles produced by the infrared spectrometer indicate that Phobos may be covered by a global layer of dust. Topography measurements derived from the Mars laser altimeter suggest active processes altering the surfaces of the polar regions. Dr. Pilcher showed several images of Europa taken by Galileo indicating chaotic terrain in an area know as "the mitten." The Deep Space (DS)-2 mission, which will demonstrate micro-probe systems, will be launched on January 3 (piggyback on the Mars 98 Lander). The technology demonstrated on DS-2 can be used on future Mars landers. The suite of Mars missions about to be launched is focused on weather, climate, and volatiles. The Draft AO for the Outer Planets/Solar Probe missions will be released for comment December 1, with final AO release planned for March 1. Under the Discovery AO, five missions were selected for Phase A studies—Messenger (an orbiter mission to Mercury), Aladdin (a Phobos-Deimos exploration and sample return), Inside Jupiter (investigating Jupiter as an astrophysical object), Deep Impact (exploring the interior of a comet), and Vesper (a study of Venus atmosphere). In addition, one Mission of Opportunity (an ion spectrometer) was selected. Selections will be announced in June concerning which missions will proceed into development.

Dr. Squyres discussed the major topics addressed during the Solar System Exploration Subcommittee (SSES) meeting on November 16-17. The new Mars architecture is a substantial improvement over the previous architecture. Questions remain regarding implementation costs and specific roles of the international partners, but these should be resolved over the coming months. The SSES strongly endorsed the substantial French participation in the Mars program and also endorsed the potential Italian participation, which could enable deep subsurface sampling and significant in-situ science. The program should continue to integrate the Human Exploration and Development of Space (HEDS)-funded activities into the program, as has been done on the Mars 2001 missions. The SSES emphasized the importance of addressing planetary protection issues aggressively and early in the program. The implementation study should look hard at how to accomplish the core objectives of the program in the event of various possible failures. There is a strong need for a ground infrastructure for certification, handling, curation and analysis of returned samples; and work to define that infrastructure must begin relatively

soon. The SSES was very impressed with the Micromission concept. These could substantially benefit many other areas and could enable a fundamentally new class of fast, inexpensive planetary missions. OSS should investigate approaches to development of a common bus quickly with the costs for development to be shared among the possible beneficiaries of such a common bus. SSES has initiated its strategic planning activities, and five ad hoc groups have been formed to take a first cut at mission and technology priorities. An Integration Team (a subset of the SSES) has been formed to begin merging the working group inputs. The SSES felt that it is important that the skeleton outline and top-level content of the Strategic Plan be made available to the Subcommittees as soon as possible. SSES was very impressed by the breadth of the Astrobiology roadmap, and two representatives from the Astrobiology activity have been invited to be part of the SSES strategic planning activities.

Research Program Report; Response to Research and Analysis (R&A) Report

Dr. George Withbroe reviewed the recommendations of the R&A and MO&DA Task Force Report and discussed his initial analysis of how OSS might respond to those recommendations. Dr. Withbroe noted that, for a variety of reasons, the Research Division would probably not be taking any actions to implement those recommendations in FY 1999. One important factor was the need for dealing with the incremental funding situation. The consensus in the Division is that incremental funding should be terminated as soon as possible, and funds that could be reallocated for new initiatives are needed to help close this action. If "taxing" for reallocation of funds to initiate new programs starts in FY 2000, the tax would result in a decrease of 20% in the funds available for competition for existing programs in FY 2000, and 10% each in FY 2001 and FY 2002. There is also an issue in dealing with the workload associated with proposals generated by new initiatives. Ideally, a decision on taxes and the approach to be taken to respond to the Task Force recommendations should be made prior to release of the ROSS 1999 NRA. In practice, this may not be possible. Dr. Withbroe reviewed the current ground rules for the review process and some possible steps that might be taken to ease the workload problem. The new SR Division Director will be faced with a major job in addressing these issues.

Space Operations Management Office (SOMO)

Mr. Stan Newberry discussed the SOMO and the Consolidated Space Operations Contract (CSOC). Information on CSOC can be found on the Web site <www.jsc.nasa.gov/somo/>. The SOMO goals are to provide space operations services that are responsive to customers at the lowest cost to the Agency, transition space operations services to commercial providers, and restructure management and operational processes using the concept of a customer service provider. Mr. Newberry briefly reviewed the space operations responsibilities involved in the SOMO effort across all of the NASA Field Centers and described the SOMO organization. Many of the mangers in the organization report functionally to the SOMO but are located at the Field Centers. He stated that he felt that the distributed management approach was working well. He noted that there is a Board of Directors overseeing SOMO containing representatives from all of the involved Enterprises (Dr. Riegler for OSS); and so, there is an established mechanism for dealing with issues as they arise. In the January/February timeframe, customer forums will be held to brief customers and project managers and receive feedback on whether things are working as planned.

Mr. Rich Schell representing the recently selected CSOC contractor (Lockheed-Martin Space Operations Company) discussed the far-term integrated operations architecture (IOA) vision. The primary focus of current activities is to be ready on January 1, 1999, to transition existing contract work to the CSOC. The second area of focus is the initial definition of the IOA and its planned evolution over the projected 10 years of the contract. Two hundred seventeen service elements were part of the CSOC RFP. Over 100 missions were examined. Mr. Newberry noted that SOMO is aware of the increase in the OSS mission set and the demands on ground operations that will be imposed by that increase. Over the next 5 years, the ground network will move to an intranet/internet-based system. Mr. Schell stated that the services a project wants to use will be selected by the customer from a services catalog which will be a tool for the customer and users. One of the questions raised by SScAC was: Who makes the decision on whether to use CSOC services? Dr. Riegler noted that the basic principle is whether there really is freedom of choice. The rationale for SOMO is to make sure CSOC provides the lowest cost services to the Agency. Given the existence of CSOC, will projects really be able to choose another approach for ground operations if they believe such a choice will result in lower costs? In principle, full cost accounting should help the Enterprises make such choices. The issue of who sets priorities when operations tradeoffs have to be make because of a finite capacity (e.g., the DSN) was raised during the discussion. It was stated that setting of scientific priorities is still part of the Enterprise responsibilities, and CSOC will not change such priorities. CSOC's job is strictly to provide the services the Enterprise needs to carry out its program. There should not be the kinds of conflicts for use of networks for earth-orbital missions that exist in the case of the DSN. As ground network demands increase, CSOC should be able to obtain commercial services for additional capacity and will make these available. SScAC was concerned about the net cost of doing science and noted that the community wants reassurances that these costs won't increase because of the development of a large infrastructure which then has to be fed. One concern over the SOMO concept is that it will constitute something of a monopoly, and there will be pressure on projects to use the existing infrastructure. The Committee posed the question: How will competitive pressures be introduced within the overall structure of SOMO and CSOC to drive costs to users down? Mr. Newberry noted that SOMO is working on the performance metrics for the CSOC during the transition period and offered to provide them to SScAC after they are developed.

Dr. Guenter Riegler addressed MO&DA issues related to the SOMO. He noted that SOMO provides no funding for science operations but wants to be involved in mission architecture decisions in order to ensure compatibility with the SOMO approach. OSS is concerned about the CSOC scope. Dr. Riegler stated that he felt that OSS had not been adequately involved in developing the groundrules for the competition and in the selection process. Despite previous claims, OSS has been told that there will be no cost savings in FY 1999 or FY 2000 and little in the first 5 years. There is supposed to be substantial savings occurring by the tenth year of the contract. Dr. Riegler also noted that substantial disagreements are developing between SOMO and the Enterprises concerning areas of authority and responsibility. Operations funds really cover two main areas of activity: operations of the ongoing missions themselves and technology/development work on new operations capabilities. Frequently, tradeoffs have to be made on resource allocation between these categories. The past agreement was to move full budget management authority for operations to the science enterprises. SOMO has now

proposed to retain development/technology funds, transferring only operations funds. Dr. Riegler stated that this position is contradictory to the original charter for SOMO. Dr. Riegler identified two basic issues: tasks/responsibilities appear to be coming into OSS without the accompanying funding; and decision-making/budget authority is being taken out of OSS. Both of these issues need to be resolved by the SOMO Management Council. At this point, the only thing that is irreversible is the fact that there will be a consolidated contract for space operations on January 1. The full scope of that contract and many of the details of the actual implementation are still somewhat negotiable.

SScAC felt that a number of critical issues had been raised by the discussion but that the Committee did not have adequate information on many of these issues to arrive a valid conclusions. A follow-on session is needed at the next meeting and a focused set of questions should be prepared by the Committee so that SOMO can be prepared to directly address SScAC's major concerns about the direction and implications of this critical activity.

Friday, November 20

The major points/recommendations discussed by the Committee are summarized in the letter from Dr. Black to Dr. Weiler contained in Appendix D. Other key points singled out for attention during the discussion were:

- Membership—As soon as a new SScAC Chair is appointed, priority will have to be given to reconstituting the membership of the Committee. It is crucial to have a reconstituted committee in place to guide/participate in the next cycle of the strategic planning process.

- Strategic Plan—SScAC endorsed the general approach and schedule presented by Dr. Allen. Dr. Allen agreed to develop a more detailed outline for the plan for use by SScAC and the Subcommittees in organizing their roadmapping/strategic planning activities. As previously noted, such an outline was developed and circulated to Dr. Black and the Subcommittee Chairs for review and approval following the meeting.

- Mars Program Architecture – SScAC endorsed the basic plan together with the comments on this plan provided by the Solar System Exploration Subcommittee. SScAC is particularly concerned as to whether the budget supports the proposed architecture and whether adequate provisions have been made for data analysis, supporting R&A (particularly for the development of sample handling and analysis tools and facilities), and for education and outreach.

- Planetary Protection Task Force – SScAC endorses the establishment of this Task Force but wanted the activities of the Task Force to be undertaken on a more accelerated schedule. The approved Terms of Reference reflecting these changes is contained in Appendix E.

- SOMO – SScAC was dismayed by exchange which took place during the presentation and felt that there seems to be a profound lack of communication among the various key parties. SScAC would like a more focused briefing from SOMO at the next meeting and SScAC will

develop a set of specific questions to serve as the basis for that briefing and the subsequent discussion between the SOMO and the Committee. Dr. Black will present some general concerns regarding SOMO to the NAC meeting, but it is clear that the Committee needs much more information before it can take a position on this subject.

- The next meeting of SScAC will be held February 24-26, 1999, in Cocoa Beach, Florida. It was agreed that all four Subcommittees would meet concurrently in Cocoa Beach just prior (February 22-23) to the SScAC meeting. The intent of the concurrent Subcommittee meetings is to facilitate cross-theme coordination as an integral element of the strategic planning process. Strategic planning will be the major focus of the SScAC meeting itself.

Final Agenda
Space Science Advisory Committee Meeting
NASA Headquarters--MIC 7
November 18-20, 1998

Wednesday November 18		
9:00 AM	Opening Remarks/Announcements	Black
9:15	OSS Program and Budget Status	Weiler
10:00	Discussion	
10:30	Working With the Decadal Survey	Riegler
11:00	Astrobiology Implementation Plan	Hubbard
11:30	Discussion	
11:45	Astrobiology Roadmap	Meyer/Morrison
NOON	Working Lunch	
1:00 PM	Ethics Briefing	Falcon
1:45	Preparing for the 2000 Strategic Plan	Allen
2:15	Discussion	
2:30	Technology Program Highlights/Issues	
	- Proposal for a Technology Task Force	Ulrich
3:00	Discussion	
3:15	Committee Discussion/Review of Key Issues	
4:45	ADJOURN	
6:30	Group Dinner—Hunan Chinatown, 624 H Street NW	

Thursday November 19		
8:30 AM	Announcements	Black
8:45	Mars Program Architecture	Elachi
9:30	Proposal for a Planetary Protection Task Force	Rummel
10:00	Theme Status Reports/Reports from Subcommittees	
	- Sun-Earth Connection	Withbroe/Christensen
10:30	- Astronomical Search for Origins	Thronson/Black
11:00	- Structure & Evolution of the Universe	Bunner/Blandford
11:30	- Solar System Exploration	Pilcher/Squyres
NOON	Lunch/Technology Exhibit and Demonstrations	
1:00	Research Program Report	
	- Response to R&A Report	Withbroe
1:30	Discussion	
1:45	Science Operations Management Office (SOMO)	Newberry
2:45	Space Science Enterprise and SOMO	Riegler
3:15	Committee Discussion/Review of Key Issues	
5:00	ADJOURN	

Friday November 20		
8:45 AM	Announcements	
9:00	Finalize Recommendations	
10:00	Report to the AA for Space Science	Black
NOON	ADJOURN	

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SPACE SCIENCE ADVISORY COMMITTEE
NASA Headquarters
November 18-20, 1998

MEETING ATTENDEES

Committee Members:

Black, David C. *(Acting Chair)*	Lunar and Planetary Institute
Anderson, Christine M.	Air Force Research Laboratory
Blandford, Roger D.	California Institute of Technology
Christensen, Andrew B.	The Aerospace Corporation
Des Marais, David J.	NASA/Ames Research Center
Dressler, Alan M.	Carnegie Observatories
Hastings, Daniel E.	U.S. Air Force
Hawkins, Isabel	University of California, Berkeley
McCleese, Daniel J.	Caltech/JPL
Rosendhal, Jeffrey D. *(Executive Secretary)*	NASA Headquarters
Squyres, Steven W.	Cornell University
Urry, C. Megan	Space Telescope Science Institute
Vondrak, Richard R.	NASA/GSFC

NASA Attendees:

Allen, Marc	NASA Headquarters
Betts, Bruce	NASA Headquarters
Bredekamp, Joe	NASA Headquarters
Brody, Steve	NASA Headquarters
Bunner, Alan	NASA Headquarters
Calabrese, Mike	NASA/GSFC
Cherry, Barbara	NASA Headquarters
DeVincenzi, Don	NASA/ARC
Falcon, Andrew	NASA Headquarters
Frederick, Suzanne	NASA/JPL
Hubbard, Scott	NASA/ARC
Jenkins, N.	NASA Headquarters
Lintott, John	NASA/LaRC
Morrison, David	NASA/ARC
Netting, Ruth	NASA Headquarters
Norris, Marian	NASA Headquarters
Pilcher, Carl	NASA Headquarters
Riegler, Guenter	NASA Headquarters
Rummel, John D.	NASA Headquarters
Slavin, J.	NASA/GSFC

Sorrels, Carrie	NASA Headquarters
Thronson, Harley	NASA Headquarters
Ulrich, Peter	NASA Headquarters
Withbroe, George	NASA Headquarters
Woods, D.	NASA Headquarters
Zanetti, Larry	NASA Headquarters

Other Attendees:

Akinwole, Barbara	NAS
Brennan, Don	Orbital
David, Leonard	*Space News*
Delamere, Alan	Ball
Di Biasi, Lamont	L. Di Biasi Associates
Giovane, Frank	U.S. Navy
Herman, Dan	*[consultant]*
Lancaster, Heather	SAIC
Malff, David	*Science*
Mellors, Jane	ESA
Niehoff, John	SAIC
Obermann, Richard	House Science Committee
Reichhardt, Tony	*Nature*
Schell, R.	Lockheed-Martin
Silva, Dick	TRW
Snyder, Amy	GW Space Policy Institute
Stabekis, Perry	Lockheed-Martin

SPACE SCIENCE ADVISORY COMMITTEE
NASA Headquarters
November 18-20, 1998

RECOMMENDATIONS

December 15, 1998

Dr. Ed Weiler
Code S
NASA Headquarters
Washington, DC 20546

Dear Ed:

I am writing to convey to you the recommendations and comments resulting from the Space Science Advisory Committee (SScAC) meeting held in Washington on November 18-20, 1998. Let me begin by congratulating you, on behalf of the SScAC, for your recent appointment as Associate Administrator of the Office of Space Science. We also wish to applaud your recent decision regarding shipment of the AXAF. We recognize that it was not an easy decision to make, but your decision appears to have been a good one.

The SScAC also wishes to thank Pete Ulrich for the informative and interesting technology exhibit that we had the opportunity to tour during our meeting. We recognize that Pete has a challenge in pulling together technology programs in a new way. The Technology Task Force should help in meeting this challenge.

The SScAC dealt with a number of issues during our recent meetings. This letter summarizes what we believe to be the more essential ones that emerged during our meeting.

SPACE OPERATIONS MANAGEMENT OFFICE (SOMO)

We appreciated the SOMO/CSOC briefing by Stan Newberry and Rich Schell, and we applaud their apparent willingness to discuss SOMO with interested parties. ***None of the briefings that the SScAC have received to date, however, provide clear insight into the basic decision-making process of SOMO.*** Mr. Newberry's willingness to continue a dialog with the SScAC on SOMO is encouraging.

We applaud the stated goal of achieving cost savings through consolidation of operations, provided there is a clear mechanism for optimization based on both cost and science consequences. Achieving this optimization requires a well-defined process for decision making by the SOMO Management Council. We expect that this process and associated guidelines will be put in place soon by the Space Operations Council. ***In light of the obvious implications of operations for the effective conduct of space science missions, the SScAC is anxious to review both the process and guidelines for SOMO decision making at the earliest opportunity.***

ASTROBIOLOGY

The revised management structure for the NASA Astrobiology Institute (NAI) appears to address many of the concerns on this topic that the SScAC noted in our previous letter to Dr. Huntress. We were pleased to see that on matters of scientific policy and Institute scientific emphasis, the Institute Director reports to NASA Headquarters, while reporting to the Director of Ames on matters of infrastructure support. This reporting structure and the addition of an "Independent NAI Science Oversight Committee", should provide adequate opportunity for

community assessment and input with regard to the Institute. We especially applaud the fact that membership of this key committee will be determined by your office and that the committee reports to you.

We were pleased to hear that the search for a Director of the Institute is proceeding and that there is a short list of strong candidates. It is critical that the new Director influence major decisions regarding scientific direction of the NAI.

The virtual aspect of the NAI concept is an important and difficult experiment in the conduct of scientific research. It may, therefore, be prudent to "walk before trying to run". In that regard, ***we strongly urge that NASA select only a very small number of new members to the Institute in the next solicitation in order to give this experiment the best chance to succeed***.

MARS PROGRAM ARCHITECTURE

The SScAC compliments the Mars Program Architecture study team on developing a concept that appears to be a substantial improvement over the previous one. It is flexible, and holds promise for advancing Mars science. The probability of success appears to have increased over the previous architecture, both because of increased redundancy and because the need for a rendezvous on the Martian surface has been eliminated. We note that international partnerships play a major role in enabling this new architecture, and ***we strongly endorse the establishment of these partnerships.***

On a cautionary note, we note that the cost of several elements of the program has yet to be determined accurately, and the exact nature of the commitments by international partners remains uncertain. ***The SScAC stresses that future refinements of the plan for Mars exploration need to address explicitly data analysis and R&A funding, as well as education and outreach.***

The SScAC notes with some concern the need for prompt action by NASA to address many open questions associated with planetary protection, and the infrastructure for certification, handling, curation, and analysis of returned samples (astromaterials). In this regard, we concur with the modified charter for the proposed Task Force on Planetary Protection, and urge NASA to proceed with this activity. The matter of astromaterials infrastructure should be referred to the SSES and OS for review.

OSS STRATEGIC PLAN

The SScAC accepts the proposed schedule for development of the next version of the OSS Strategic Plan. The schedule appears to be reasonably well aligned with that of the NAS Decennial Survey. We have adopted the format used for the previous strategic plan as the one that will be used in all of the Theme Roadmaps as well as the overall Code S Strategic Plan.

SScAC TASK FORCES

The SScAC reviewed draft charters for two proposed Task Forces. One noted above, dealing with Planetary Protection and the other dealing with technology. We concur with the charter of the Technology Task Force as amended (see attachments for amended charters). The Technology Task Force can play a key role and we look forward to their input to the strategic planning process.

R&A TASK FORCE

We recognize that personnel transitions in key areas have made it impossible to respond yet to the recommendations of the R&A Task Force. We look forward to hearing the new Director of Code SR discuss implementation plans at the February SScAC meeting.

Again, on behalf of the entire SScAC, congratulations on your appointment. We look forward to working with you as we prepare to enter the next millennium.

Sincerely,

David C. Black
Acting Chair, SScAC

SPACE SCIENCE ADVISORY COMMITTEE
NASA Headquarters
November 18-20, 1998

TASK FORCE TERMS OF REFERENCE

PLANETARY PROTECTION TASK FORCE
OF THE
SPACE SCIENCE ADVISORY COMMITTEE

TERMS OF REFERENCE
DECEMBER 16, 1998

These Terms of Reference establish the Planetary Protection Task Force of the Space (PPTF) Science Advisory Committee (SScAC), a standing committee of the NASA Advisory Council. The PPTF is chartered to provide SScAC with findings and recommendations on programs, policies, plans, and other matters pertinent to NASA's responsibilities for planetary protection in solar system exploration.

Key issues to be addressed in the 1-year term of this Task Force will be to (1) review current NASA planetary protection policy components, implementation plans, and organization—including the planned implementation of the planetary protection policy with respect to future Mars missions; (2) assess the structure and level of future advisory activities, interagency coordination, and intergovernmental planning related to planetary protection in the next decade; and (3) recommend appropriate assignment of small bodies of the solar system with respect to the framework provided by the Space Studies Board in their report, *Evaluating the Biological Potential in Returned Samples from Planetary Satellites and Small Solar System Bodies: Framework for Decision Making*. While the Task Force recommendations in general are to be reviewed by SScAC, some recommendations involving item (3) above, and others, may require advice to the Associate Administrator on a short time scale. In such cases, action on Task Force recommendations may be taken on behalf of SScAC by its Executive Council.

NASA has a planetary protection policy that is intended to preserve biological and organic conditions for future solar system exploration (i.e., prevent forward contamination) and to protect the Earth and its biosphere from possible biological organisms that might be found elsewhere (i.e., prevent back contamination). Planetary protection mission constraints depend on the nature of the mission and the target body and take into account current scientific knowledge through recommendations from both internal and external advisory groups—most notably from the Space Studies Board of the National Academy of Sciences. The policy is delineated in NASA directive NPD 8020.xx.

Two recent Space Studies Board reports on planetary protection, *Mars Sample Return: Issues and Recommendations* (1997) and *Evaluating the Biological Potential in Returned Samples from Planetary Satellites and Small Solar System Bodies: Framework for Decision Making* (1998) have advised NASA to establish "a panel of experts" (1997) or "an advisory committee with expertise in the planetary and biological sciences" to make recommendations on the nature of planetary protection requirements for different small solar system bodies and to oversee the overall planetary protection program at NASA. Given the specific Space Studies Board recommendations with respect to Mars and to other sample return missions now being planned and the increased flight rate to solar-system bodies of exobiological significance, NASA needs to secure the advice of such a body at the earliest opportunity. In particular, the Space Studies Board has recommended that such a body provide a recommendation on the planetary protection requirements for the Muses-C mission, and these requirements need to be set within the next several months if NASA participation in the sample return phase of the mission (and the return of samples to Utah) are to be approved on schedule. Consequently, it is proposed that the Space Science Advisory Committee (SScAC) establish a Planetary Protection Task Force at this time.

MEMBERSHIP

The Chair for the PPTF will be appointed by the Associate Administrator for Space Science with written concurrence of the Associate Deputy Administrator. Membership will be comprised of experts from academia, industry, and Government with recognized knowledge and expertise in scientific, technological, and programmatic fields relevant to planetary protection. The Task Force will consist of 12 to 15 members and an SScAC liaison. Term of membership will be for the duration of the Task Force.

MEETINGS

The Task Force will meet two to three times.

REPORTING

The Task Force will report its findings and recommendations to the Space Science Advisory Committee.

ADMINISTRATIVE PROVISIONS

The Planetary Protection Officer will serve as Executive Secretary and will serve as the Designated Federal Official.

The Office of Space Science (OSS) will provide staff support for the Task Force. OSS will provide for any expenses associated with the Task Force.

DURATION

The Task Force will operate for approximately 12 months from the date of these Terms of Reference. Reports will be made to SScAC after each meeting of the Task Force. The Task Force is expected to have its first meeting in February 1999. At that time, the Task Force membership will be briefed on current NASA policy and plans in planetary protection, organizational structure, budget, and planning for future missions. A report on the recommended advisory structure for planetary protection will be made no later than September 1999, and a final report of the Task Force's activities will be made to SScAC on or about March 1, 2000, at which time the PPTF will be disestablished.

TASK FORCE ON TECHNOLOGY READINESS
OF THE
SPACE SCIENCE ADVISORY COMMITTEE

TERMS OF REFERENCE

DECEMBER 16, 1998

These Terms of Reference establish the Task Force on Technology Readiness (TFTR) of the Space Science Advisory Committee (SScAC), a standing committee of the NASA Advisory Council. The TFTR is a fact-finding team and is chartered to provide SScAC with findings and recommendations on the current technology strategy process to ensure linkage between science missions and technology opportunities and to ensure cross-Theme coordination of technology requirements. Final recommendations to the Associate Administrator for Space Science concerning technology readiness in support of the next version of the space science strategic plan will be made by SScAC after receiving the TFTR report.

In November of 1997, based on 2 years of previous work, the Space Science Enterprise published an ambitious strategic plan containing a number of mission concepts that push the limits of the technologically possible. Successful completion of much of this visionary program depends on revolutionary advanced technologies that have not yet been developed or, in some cases, proven feasible. Therefore, as the next round of strategic planning gets underway early in FY 1999, it is extremely important that advanced technology development (ATD) plans are reviewed, updated, and critically assessed for readiness to support strategic space science mission milestones and that the results of such reviews are incorporated as an integral element into the strategic planning process.

Key readiness issues that need to be addressed include the relevance of the current and planned ATD programs to meet strategic needs, the identification of significant new requirements for technology development, the adequacy of resources to meet key milestones within projected funding profiles, the prioritization across ATD programs, and the adequacy of coordination of space science enterprise-funded and managed technology development with other NASA and non-NASA programs.

It is extremely important that there be optimal and timely coupling of ATD strategic planning and implementation with the space science strategic planning process. This intimacy in planning will foster (1) readiness of key enabling technologies to meet mission milestones; (2) balance and effectiveness in the use of scarce ATD resources by identification, through science prioritization, of the most critical technology needs; (3) assurance that ATD activities outside the purview of space science funding authority will be considered as part of the ATD strategy in order to avoid unproductive duplication; and (4) establishment of strong coupling for mutual benefit between the science vision and exciting technology opportunities, especially in the far term.

This coupling can best be accomplished during the development of the next strategic plan by periodic joint meetings attended both by key representatives of all four of the Space Science Theme Subcommittees and by technology leaders from the space science and cross-enterprise technology community. Both near-, mid-, and far-term technologists would be present at these joint and simultaneous planning meetings.

MEMBERSHIP

The TFTR will be co-chaired by two technologist members of the SScAC, appointed by the Associate Administrator for Space Science with written concurrence of the Associate Deputy Administrator. Membership is composed of six committee and subcommittee members with the addition of no more than six others from outside of NASA. Two of the members will also serve as joint members of both the Task Force and the Technology and Commercialization Advisory Committee to provide liaison between these groups. These latter will be experts in spacecraft systems and supporting infrastructure technologies for space science missions. The Director of

Advanced Technology and Mission Studies Division will serve as Executive Secretary to the TFTR. Term of membership will be for the duration of the Task Force.

MEETINGS

The Task Force will meet three or four times.

REPORTING

The Task Force will report its findings and recommendations to the Space Science Advisory Committee.

ADMINISTRATIVE PROVISIONS

The Division Director for Advanced Technology and Mission Studies will serve as Executive Secretary and will serve as the Designated Federal Official.

The Office of Space Science will provide staff support for the Task Force. OSS will provide for any expenses associated with the Task Force.

DURATION

The Task Force will operate for approximately 12 months from the date of these Terms of Reference to coincide with the planning period for update of the Space Science Enterprise Strategic Plan. Regular reports will be made to the SScAC. A final report will be submitted to the SScAC in time to support the strategic planning cycle but no later than September 30, 2000, at which time the TFTR will be disestablished.

SPACE SCIENCE ADVISORY COMMITTEE
NASA Headquarters
November 18-20, 1998

STRAWMAN STRATEGIC PLAN OUTLINE

13Nov98

SSE Strategic Plan 2000

Proposed Outline

Executive Summary (Separate Brochure)

Frontispiece (Fundamental Questions)

Part I—Our Goals

1. Introduction
2. Fundamental Science Questions, Goals, and Objectives
3. The Role of Enabling and Enhancing Technology
4. Education and Public Outreach

Part II—Our Program

1. Recent Accomplishments
2. Principles and Priorities
3. Near-Term Program: 2003-2007
4. Mid-Term Program: 2008-2013
5. A Possible Future: 50 Years From Now
6. Education and Public Outreach
7. Partnerships

Part III—Conclusion

Appendices

SPACE SCIENCE ADVISORY COMMITTEE
NASA Headquarters
November 18-20, 1998

LIST OF PRESENTATION MATERIAL[1]

1) Overview of the Space Science Enterprise [Weiler]
2) NASA Astrobiology Institute (NAI) Implementation Plan [Hubbard]
3) NASA Astrobiology Roadmap Progress Report [Morrison]
4) Planning for the Space Science Enterprise Strategic Plan 2000 [Allen]
5) Space Technology Task Force [Ulrich]
6) Preliminary Architecture Team Report - Mars Exploration Program [Elachi]
7) Proposal to the SScAC for a Planetary Protection Advisory Task Force [Rummel]
8) SECAS Report to SScAC [Christensen]
9) Astronomical Search for Origins - Report to the SScAC]Thronson]
10) Report of the Origins Subcommittee [Black]
11) Structure and Evolution of the Universe - Theme Director's Remarks [Bunner]
12) Laser Interferometer Space Antenna [LISA]
13) SSES - Major Topics of November 16-17 Meeting [Squyres]
14) Restructuring of the R&A Program; Reviewing the R&A Program [Withbroe]
15) Task Force on Technology Readiness - Proposed Charter [Anderson/Hastings]

Other material distributed at the meeting:

1) Comparison of Criminal Conflict of Interest Statutes and Other Ethics Related Provisions Applicable to Special and Regular Government Employees
2) The Space Science Enterprise Integrated Technology Strategy

[1] Presentation and other material distributed at the meeting is on file at NASA Headquarters, Code S, Washington, DC 20546.